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ABSTRACT

The program for preparing mathematics teachers which is described in this booklet has as its major objective the development of mathematics clinicians, that is, teachers skilled in educational diagnosis and remediation. The program incorporates classroom experiences, laboratory experiences, practicums, and a seminar. The courses required include a core program covering learning theory, human growth and development, research techniques, and educational foundations. Twenty-four quarter hours of mathematics are required. The program has been partially implemented in summer workshops at Kent State University, and evaluated in that context. A resolution of the Ohio Council of Teachers of Mathematics recommending the certification of mathematics specialists in Ohio is included in this document. (SD)

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American Association of Colleges for Teacher Education

1976 Distinguished Achievement Awards Application

Dr. James W. Heddens
Kent State University
College of Education

Mathematics Education Specialization Program

Mathematics Clinicians

Robert J. Alfonso

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SE 020 411

SUMMARY

During the past five years, Professor James W. Heddens of the Graduate School of Education, Kent State University has developed and inaugurated an unique graduate program. The primary emphasis of this creative venture is the preparation of competent mathematics clinicians who have expertise in systematically investigating and isolating specific mathematics difficulties encountered by children.

After a thorough literature search (over four hundred entries were scrutinized) all available knowledge was analyzed and synthesized in order to develop unique summer workshops for experienced teachers. The teacher participants provided valuable evaluation feedback utilized in developing the program as it exists at the present time.

For a number of years colleges and public schools have observed a need for remedial reading clinics and reading specialists within the public school setting. Little if any provision has been made for the child having difficulty with mathematics and in need of remedial mathematics. Schools have need for professionally trained mathematics specialists who have expertise in systematically investigating and isolating children's specific mathematics difficulties, in determining the nature of the difficulties, and in prescribing and conducting corrective teaching. Thus there is a need for a clinical setting that is equipped to provide leadership, diagnostic facilities and an ideal environment for training mathematics clinicians to function as mathematics specialists in schools.

The new program developed at Kent State University incorporates classroom experiences, laboratory experiences, practicums, and a seminar into an integrated developmental mathematics clinician training program. The program

consists of three phases; namely, the core courses, major courses, and electives. The core of twelve quarter hours encompasses research techniques, learning theory, foundations, and human growth and development.

The mathematics clinician major of twenty-four quarter hours provides for the improvement of the clinicians' understanding of mathematics content that is taught to children. An opportunity is provided to study new developments by examining the experimental mathematics program materials available from around the world. Through participation under supervision the mathematics clinician major examines and administers many standardized mathematics diagnostic instruments as well as related screening instruments. Under supervision the clinician in training is required to learn how to develop, administer, and evaluate informal diagnostic techniques. A clinical practicum is conducted in conjunction with the study and utilization of formal and informal diagnosing instruments. Corrective teaching is examined in a similar manner.

DESCRIPTION AND DEVELOPMENT OF THE PROGRAM

Each year elementary classroom teachers seem to be doing a more effective job of teaching mathematics to children. No matter how sophisticated and effective our technique of teaching mathematics to children becomes we always will have children who experience difficulty in learning mathematics. In the normal classroom setting it is very difficult to cope effectively with children who have severe mathematics difficulties.

Observing that children are receiving help in remedial reading, using effective diagnostic reading instruments, supported by extensive research in remedial reading, and reading clinics raised the question: What help is being provided for children who are experiencing mathematics difficulties? About five years ago Professor James W. Heddens of Kent State University began searching for mathematics diagnostic instruments, research supporting diagnostic procedures, and corrective teaching. The dearth of research and material for remedial mathematics was appalling. The only significant contribution in the area of diagnosis and corrective teaching were made by John Wilson and Edward Uprichard. As a result the following questions were defined:

1. Which universities provide training programs for mathematics specialists or mathematics clinicians?
2. What universities have mathematics diagnostic clinics for diagnosing and remediating childrens' mathematics difficulties?
3. Who is systematically developing research to answer the question regarding diagnosing and remediating childrens' mathematics difficulties?

These questions provided the base upon which the new mathematics education specialization program was developed.

The primary purpose of the project was to develop a mathematics education specialist program for training mathematics clinicians capable of diagnosing

mathematics difficulties, prescribing remediation and conducting corrective teaching in both clinic and classroom settings. A secondary purpose was to provide a clinic where children with severe mathematics difficulties could receive professional help. The program was designed to accomplish these goals as well as involve as many different teaching modes as possible to meet the learning styles of the graduate students.

After conceptualization of the clinic and its purposes, energies were devoted to synthesizing a creative training program. A thorough study was made of teaching techniques, materials, and teaching media. General objectives were written for the new program. The general objectives were interpreted into specific objectives designed in the cognitive, affective and psychomotor domains. With objectives as a base the program had to be constructed into the university organization.

Provision has been made for input via lecture, discussion, and individual instructor interaction. A multi-media approach is being used utilizing audio tape recorders, overhead projectors, video tape recorders, edex teaching machine, and punch boards.

The college students begin by building a theory base including theories of cognitive style, cognitive mapping and mathematics learning theory. The theory is translated into reality by observing experts functioning with diagnosing childrens' mathematics difficulties via video tapes. (Dr. Underhill, University of Houston; Dr. Uprichard, University of South Florida; Dr. Wilson, University of Maryland; Dr. Callahan, University of New York at Buffalo). Small group discussions provide the opportunity to identify, discuss, and evaluate the finesse demonstrated by the mathematics diagnosticians.

Administering standardized evaluative instruments to peers is used as a technique for developing fundamental skills and self confidence. After confidence is gained from the peer interactions, the college students are involved in practicums with children under the close supervision of the college professor. Video taping is used as a technique of the college student self evaluating his

effectiveness as a mathematics diagnostician. When the college student is comfortable with the child, the video taping, and the college professor mutual viewing of a tape and critiquing are used as techniques of refining diagnostic techniques.

The mathematics clinician in training must become proficient in administering formal standardized tests and screening devices, interpreting standardized test results, interviewing both children and parents, preparing informal mathematics diagnostic evaluative situation, interpreting and interrelating data collected, writing diagnostic case studies, preparing individual prescriptions defining corrective teaching needs, material, and techniques. The program is a many faceted approach to developing mathematics clinicians providing for many different styles of learning.

PERSONNEL

The program has been planned, developed and implemented by Professor James W. Heddens. Bill Speer, graduate research assistant has been utilized for one quarter after the program was implemented. Graduate assistant help has been available to work with the principal developer on his undergraduate teaching load. However, each graduate assistant was assigned a teaching load along with working in the undergraduate program. A minimum of secretarial help has been available through the department secretary pool.

BUDGET

The College of Education provided constant verbal support for the development of this program. Because of the budget crunch no funds had been defined for the development or implementation of this new program. Development of the program was accomplished by the innovator while teaching a full load of twelve quarter hours each quarter. Commitment was indicated by the college when office space, workroom and a classroom was provided. After the implementation of the new program one hundred dollars was authorized by the college for xeroxing necessary

material. Other materials, tests, and equipment are being obtained, developed, and made at the expense of the developer of the program. The university has provided a research assistant for one quarter of 1975. It is hoped additional graduate student help will be available in the future.

EVALUATION

Each pilot summer workshop participant provided feedback through an evaluation questionnaire. This information was critically analyzed and utilized in development of the new program. Each workshop would focus on theory, techniques, and practical applications. A segment of the time was devoted to an equipment construction laboratory directed by an expert consultant enabling the participants to construct remedial teaching aids and corrective instructional devices. This basic idea has been incorporated into the new program.

As a result of the evaluations from the workshops, beginning diagnostic work is done in teams in order that the team members may take turns working with the child and with keeping a log. Now a log is kept of all diagnostic sessions providing valuable detailed information for research and evaluation.

A select number of elementary school children who have had mathematics difficulties diagnosed through the practicum are involved in a follow up study. The principal investigator visits the child's local school to discuss the program of the child with the school principal, teacher, parent, and child. Some time during each monthly visit is devoted to corrective teaching by Dr. Heddens.

April 8, 1976 an invitational research conference has been scheduled. Twenty of the top individuals in the United States studying remedial mathematics will meet at Kent State University to collectively organize for a national movement of systematic research and development of mathematics diagnosis and mathematics corrective teaching.

The State of Ohio has certification for reading specialists. No certification is available for mathematics specialists or clinicians. Dr. Heddens, through a

state committee, initiated steps to obtain Ohio State Certification for mathematics specialist.

With the support of Ohio State Mathematics' Supervisor, Steve Meiring, the idea of a mathematics specialization certification was presented at a state mathematics conference, September 19, 1975. As a result of the conference the following resolution was passed:

> Resolve that the Division of Teacher Education and Certification; the Ohio Department of Education, study the areas of certification with a view toward extending these to include certification for specialists in diagnosing and corrective mathematics learning difficulties in grades K-12.

The resolution has received further support from the Board of Directors of the Ohio Council of Teachers of Mathematics.